

**Assessment Annotations
for the Curriculum Frameworks**

Science

Grades 3, 7, and 10



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SCIENCE ASSESSMENT ANNOTATIONS

FOR THE

SCIENCE CURRICULUM FRAMEWORKS

The benchmark statements in the Science Curriculum Frameworks are at the second, fourth, eighth, and twelfth grades while the science portion of the Missouri Assessment Project will be given at the third, seventh, and tenth grades. In order to provide assistance in curriculum alignment to administrators, curriculum directors, and teachers concerning what is or is not “fair game” content for the science assessment, the attached document was developed by practicing classroom teachers and administrators.

This document includes the left-hand column (“What All Students Should Know”) and the center column (“What All Students Should Be Able To Do”) from the Science Curriculum Frameworks. The third column contains annotations about each benchmark as provided by several teacher work groups and is intended to provide guidance to **CTB/McGraw-Hill**, the assessment contractor. The first strand of the framework (Scientific Inquiry) was considered fair game at all grade levels and is not included in this document.

In the K-4 range, all of the benchmarks at grade two are “fair game” for assessment at grade 3. The benchmarks at grade four will have the words “Grade 3 state assessment” in the third column to denote a benchmark is “fair game” content or the words “Beyond grade 3 state assessment” to denote a benchmark that will not be considered at grade 3. Likewise, at the 5-8 range, the words “Grade 7 state assessment” or “Beyond grade 7 state assessment” will provide guidance. In the 9-12 range, the benchmarks will have annotations that say “Grade 10 state assessment” or “Beyond grade 10 state assessment.” Some of the annotations will be more specific and are self-explanatory. Not all benchmarks identified here as “fair game” for a state test will show up on the test in any given year.

Also, teacher work groups met in late **1996** and early 1997 to decide which of the seventy-three Show-Me Standards should be assessed on a statewide basis through the science performance assessment instrument. These teacher groups identified the following list of standards:

All of the Science Knowledge Standards

Performance Standards, Grade 3 :	1.3, 1.5, 1.6, 1.8, 1.10, 2.1, 3.5, 4.1
Performance Standards, Grades 7 & 10:	1.1, 1.3, 1.5, 1.6, 1.7, 1.10, 2.1, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 4.1

These standards will be the focus of the performance event of the science portion of the Missouri Assessment Project.

V UNIVERSE-----ASSESSMENT NOTES

(Show-Me Standards, Science 6)

- A. Characteristics of the Solar System**
- B. Motions of the Solar System**
- C. Technology**

K-12 Content Overview:

Students today are growing up in a world of space travel and exciting new discoveries in outer space. Studying the universe helps students understand both the nature of the universe and the important contributions space exploration has made to our understanding of the universe and mankind.

The universe contains billions of galaxies, each of which contains billions of stars of various types. Our solar system, located at the edge of one galaxy, contains a very important star (the sun), planets, moons, asteroids, and comets.

By observing the sky on a regular basis, elementary students learn to identify changes and patterns. Observations of these changes and patterns help children understand and describe what is happening in the universe. Knowledge of the universe and the Earth's position in it provides students with a sense of time and place. The Earth's location and motion in relation to that of the sun and moon causes significant changes in the Earth's physical environment. Because direct experimentation is not possible for testing most concepts related to the universe, students must rely on data collected through technology, which, in turn, requires students to develop sequential thinking skills and the ability to follow logical multisteps to draw conclusions and make predictions.

By the middle level, students identify the characteristics of stars, their composition and distance. Current models of the universe used by high school students are based on mathematical and computer simulations.

Patterns, positions and distances of celestial objects are observed and measured with the use of telescopes and satellite images. The impact of technology on data gathering, prediction, and knowledge challenges students to follow the multistep logic necessary for understanding .

V Universe A. Characteristics of the Universe

What All Students Should Know	What All Students Should Be Able To Do	Grade 3 Assessment Notes
<p><i>By the end of grade 2, all students should know that</i></p> <p>1. Earth is not alone in the universe. Most of the objects in the universe are separated by vast space and enormous distances.</p>	<p>By the end of grade 2, all students should be able to</p> <p>a. present ideas and opinions about the relationship of the sun and moon to Earth and Earth's position in the universe. (2.1)</p> <p>b. describe the major components of our solar system. (1.3; 1.8)</p>	<p>Grade 3 state assessment Sun, moon, planets in relation to each other</p>
<p>2. The sun, moon, and stars have recurring patterns.</p>	<p>a. evaluate information about the sun and moon and share to determine patterns, changes, and relationships. (1.2; 1.6; 3.5)</p>	<p>Grade 3 state assessment How sun, moon, and Earth determine length of day, month, and year</p>
<p><i>By the end of grade 4, all students should know that</i></p> <p>3. Constellations are patterns of stars</p>	<p>By the end of grade 4, all students should be able to</p> <p>a. identify sequences of change and determine patterns in these changes. (4.6)</p> <p>b. research and report on the legends of major constellations. (1.4; 1.8; 2.1)</p>	<p>Beyond grade 3 state assessment</p>
<p>4. Earth is in our solar system and has unique properties.</p>	<p>a. compare and contrast Earth's properties to other planets in our solar system. (1.2; 1.6)</p>	<p>Grade 3 state assessment</p>
<p>5. Earth rotates on a tilted axis and revolves around the sun. This combination causes changes in the amount of sunlight reaching the Earth's surface and makes our seasons.</p>	<p>a. explain how the Earth's movements and tilt give seasons. (1.4; 2.1; 2.7)</p>	<p>Grade 3 state assessment No items concerning seasons</p>

V Universe B. Motions of the Universe

What All Students Should Know	What All Students Should Be Able To Do	Grade 3 Assessment Notes
<p><i>By the end of grade 2, all students should know that</i></p> <p>1. Objects in the sky move.</p>	<p><i>By the end of grade 2, all students should be able to</i></p> <p>a. use senses to gather information about the day sky through regular observations. (1.3; 1.6; 2.3)</p>	Grade 3 state assessment
<p>2. Earth makes a full rotation on its axis every 24 hours which cause the day/night cycle.</p>	<p>a. explain the relationship of the rotation of the Earth and the day/night cycle. (1.2; 1.7; 2.3; 3.5; 4.1)</p>	Grade 3 state assessment
<p>3. Patterns of movement of some objects in the sky are cyclic.</p>	<p>a. discover and evaluate patterns in the sky. (1.6; 3.5; 4.1)</p>	Grade 3 state assessment
<p><i>By the end of grade 4, all students should know that</i></p> <p>4. The motion and positions of objects in the solar system explain observable phenomena.</p>	<p><i>By the end of grade 4, all students should be able to</i></p> <p>a. evaluate information about the motion and position of the Earth, moon, and sun to determine the patterns that give us our day, month, year, moon phases, and eclipses. (1.6)</p>	Beyond grade 3 state assessment
<p>5. Recurring predictable movements of the Earth and moon can be used to measure time.</p>	<p>a. explain how time can be based on the movements of Earth in relation to the sun, moon, and stars. (1.3; 1.6; 1.8; 2.7; 4.6)</p>	Grade 3 state assessment
<p>6. Different constellations can be seen in different seasons.</p>	<p>a. explain why certain constellations can be seen only at certain seasons. (1.6; 2.4; 3.5; 4.1)</p>	Beyond grade 3 state assessment
<p>7. The sun, moon, stars, and planets appear to move from east to west each day.</p>	<p>a. explain the reasons for different time zones. (1.2; 3.5; 4.1)</p>	Grade 3 state assessment Use sun and moon but not planets and stars

V Universe C. Tools of Space Exploration

What All Students Should Know	What All Students Should Be Able To Do	Grade 3 Assessment Notes
<p><i>By the end of grade 2, all students should know that</i></p> <p>1. Special clothing and equipment must be used by people who travel into space.</p>	<p><i>By the end of grade 2, all student should be able to</i></p> <p>a. explain the use of different clothing and equipment used by people who travel into space. (1.5; 1.6)</p>	Grade 3 state assessment
<p><i>By the end of grade 4, all students should know that</i></p> <p>2. Telescopes and satellite imaging allow scientists to observe features and structures of some objects in the sky.</p>	<p><i>By the end of grade 4, all students should be able to</i></p> <p>a. identify prominent features of the Earth and planets of the night sky. (1.4)</p>	Grade 3 state assessment Do not use satellite imaging
<p>3. Space exploration has provided many benefits to humankind.</p>	<p>a. identify and explain some ways that food, clothing, or machines have changed as result of the U.S. space program. (1.2; 3.6; 4.1; 4.7)</p>	Beyond grade 3 state assessment

V Universe A. Characteristics of the Universe

What All Students Should Know	What All Students Should Be Able To Do	Grade 7 Assessment Notes
<p><i>By the end of grade 8, all students should know that</i></p> <p>1. The universe is so large that its distances are expressed in special units (i.e., light years, astronomical units).</p>	<p><i>By the end of grade 8, all students should be able to</i></p> <p>a. use visual and mathematical aids to detennine the approximate locations of planets in the solar system. (1.4; 2.2)</p> <p>b. create a model in which the same scale is used to depict the distances between objects and calculate the time required to travel a direct path to them from Earth. (1.6; 2.1)</p> <p>c. interpret and evaluate information related to distances from our solar system to other points in our galaxy and the universe. (1.2; 1.7; 2.7; 3.5; 4.1)</p>	Grade 7 state assessment
<p>2. Celestial objects possess both similarities and differences.</p>	<p>a. use a variety of resources to compare and contrast the physical properties of planets. (1.8; 3.5; 2.3)</p>	Grade 7 state assessment
<p>3. Our Solar System is part of the Milky Way Galaxy, one of many galaxies in the universe.</p>	<p>a. use a variety of visual aids to locate the position of the Solar System in the Milky Way Galaxy. (1.5; 1.6; 2.2; 2.3; 4.1)</p>	Grade 7 state assessment

V Universe B. Motions of the Universe

What All Students Should Know	What All Students Should Be Able To Do	Grade 7 Assessment Notes
<p><i>By the end of grade 8, all students should know that</i></p> <p>1. The force of gravity determines the orbital patterns of celestial objects.</p>	<p><i>By the end of grade 8, all students should be able to</i></p> <p>a. conduct an investigation that demonstrates planetary orbits and apply the processes and knowledge learned to patterns within the solar system. (1.3; 1.6; 3.6)</p>	<p>Grade 7 state assessment</p> <p>Use questions about a planet's gravitational influence on recent comets or fly-by missions</p>

What All Students Should Know	What All Students Should Be Able To Do	Grade 7 Assessment Notes
2. Earth is a moving planet having unique features.	a. use a variety of methods, forms, and technologies to describe the Earth. (1.4; 2.7; 3.5; 4.1)	Grade 7 state assessment
3. Earth rotates on a tilted axis as it revolves around the sun causing sunlight to hit at different angles. The revolution and tilt produces seasonal variations in weather and climates .	a. evaluate how revolution, rotation, and tilt of the Earth influences the amount of sunlight that reaches the surface (1.7; 1.8)	Grade 7 state assessment
4. Moon phases and eclipses result from the angle from which we view the moon.	a. explain such phenomena as lunar and solar eclipses and moon phases. (1.6; 2.4; 2.5).	Grade 7 state assessment
5. Nine planets, their moons, comets, asteroids, and meteorites orbit the sun.	a. explain how mass and gravitational attraction of the planets affect primary orbits and how the orbits interrelate. (1.5; 1.7; 3.3; 4.6)	Grade 7 state assessment

V Universe C. Tools of Space Exploration

What All Students Should Know	What All Students Should Be Able To Do	Grade 7 Assessment Notes
<i>By the end of grade 8, all students should know that</i>	<i>By the end of grade 8, all students should be able to</i>	
1. A variety of technological tools are used to provide information concerning the physical properties and conditions of the solar system.	a. discuss how information received from space probes has either confirmed or modified scientific theories concerning conditions on other planets. (1.7, 2.4; 3.1; 3.5; 4.1)	Grade 7 state assessment Use questions about space probes and telescopes as data-gathering instruments
2. Most information about the universe comes from the electromagnetic spectrum.	a. use an illustration of the electromagnetic spectrum to describe the relationship between wavelength, energy, and frequency. (1.4; 2.7; 3.5; 4.1)	Grade 7 state assessment
3. Research associated with space exploration has resulted in technological advances that have affected the quality of life.	a. identify common products that have been developed as a result of research associated with space exploration. (1.3; 1.4)	Grade 7 state assessment

V Universe A. Characteristics of the Universe

What All Students Should Know	What All Students Should Be Able To Do	Grade 10 Assessment Notes
<p><i>By the end of grade 12, all students should know that</i></p> <ol style="list-style-type: none"> 1. The current model of the universe was developed from evidence about its content and theoretical assumptions based upon mathematical and computer-simulated models. 	<p><i>By the end of grade 12, all students should be able to</i></p> <ol style="list-style-type: none"> a. present organized arguments and opinions about the various theories of the formation of the universe. (2.4) 	Grade 10 state assessment
<ol style="list-style-type: none"> 2. Stars appear to go through a cycle of birth, development, and death. 	<ol style="list-style-type: none"> a. use information about a star's characteristics to determine its age. (1.6; 3.5) 	Grade 10 state assessment
<ol style="list-style-type: none"> 3. Because of the vast distances between objects in the universe, light may take billions of years to reach the Earth. 	<ol style="list-style-type: none"> a. explain the different units used to measure distances by astronomers and explain why they use them. (1.7; 2.2; 4.1) 	Grade 10 state assessment

V Universe B. Motions of the Universe

What All Students Should Know	What All Students Should Be Able To Do	Grade 10 Assessment Notes
<p><i>By the end of grade 12, all students should know that</i></p> <ol style="list-style-type: none"> 1. Newton's conception of the universe established the idea that the laws which apply to processes that occur on the Earth also apply to the universe. 	<p><i>By the end of grade 12, all students should be able to</i></p> <ol style="list-style-type: none"> a. evaluate information and products to determine the relationship of Newton's Laws in space and on earth. (1.3; 1.5; 1.7) 	Beyond grade 10 state assessment
<ol style="list-style-type: none"> 2. Gravitational laws explain planetary motion and tides. 	<ol style="list-style-type: none"> a. develop a logical description of how gravitation laws explain the movement of planets and tides. (1.6, 2.4, 3.5, 4.1) 	Grade 10 state assessment

v Universe C. Tools of Space Exploration

What All Students Should Know	What All Students Should Be Able To Do	Grade 10 Assessment Notes
<p><i>By the end of grade 12, all students should know that</i></p> <ol style="list-style-type: none">1. Space exploration has expanded our knowledge of the universe and advanced the technological sophistication of our society.	<p><i>By the end of grade 12, all students should be able to</i></p> <ol style="list-style-type: none">a. identify and explain ways society has benefited from the technologies developed through space exploration. (1.1; 1.2; 1.4; 1.7; 1.9; 1.10; 2.7; 2.2; 3.5; 4.1; 4.6)b. evaluate the economic impact of the space program. (1.1; 1.2; 1.4; 1.5; 1.7; 1.8; 2.1; 2.3; 3.5; 4.1; 4.6)	<p>Grade 10 state assessment</p>